Drinking Water State Revolving Fund Green Project Reserve
- Interim -

City of Moscow FY14 Water System Improvements

SRF Loan #DW 1406 (pop. 24,534)

$4,300,000

Interim Green Project Reserve Justification

(Booster Station Upgrades Only)

Business Case GPR Documentation

1. INSTALLS INSTALL NEW ENERGY-EFFICIENT VFDS AND PREMIUM EFFICIENCY MOTORS ON BOOSTER PUMPS (Energy Efficiency). GPR Business Case per Section 3.2-3: *"NEMA Premium energy efficiency motors";* and Section 3.5-1: *"Energy efficient…upgrades, or new pumping systems…including VFDs."* ($155,000).
2. INSTALL ADVANCED FLUORESCENT LIGHTING (Energy Efficiency). GPR Business Case per Section 3.5-6: "*Upgrade of lighting to energy efficient sources (such as…compact fluorescent, light emitting diode…)".* ($31,500).
3. SCADA SYSTEM INSTALLATION (Energy Efficiency). GPR Business Case per Section 3.5-7: *"Automated and remote control systems (SCADA) that achieve substantial energy savings"* ($65,000).

State of Idaho SRF Loan Program
July 2015

1. Premium Efficiency Motors[1] and VFDs

Summary

- The City received a loan totaling $4,300,000. This loan is for a new well, well house, transmission system improvements and replacing/upgrading six booster stations. This Preliminary GPR is only for Phase 1 Booster Station Upgrades which consists of upgrading three booster stations (White, Taylor, and Vista).
- Estimated Categorical energy efficient (green) portion of loan = 3.6% ($155,000). This includes the costs associated with all three booster station upgrades.
- Annual Energy savings =30%

Background

- The White Booster station consists of replacing the existing pump station with an above-grade facility capable of more efficiently providing domestic capacity via two variable frequency drive (VFD) pumps and two dedicated fire pumps (duty/standby). All pumps will be equipped with premium motors.
- The Taylor Booster station consists of replacing the existing pump station installed in the 1950s, with a new above-grade pump station providing domestic flow via three VFD pumps and two dedicated fire pumps (duty/standby). All pumps will be equipped with premium efficiency motors.
- The Vista Booster Station consists of replacing the existing pump station with an above-grade facility capable of more efficiently providing domestic capacity via two VFD pumps and two dedicated fire pumps (duty/standby). All pumps will be equipped with premium efficiency motors.
- The existing booster station pumps operate below 50% efficiency due to the large range of demands in the zone. Additionally, recycle lines are installed to allow the pumps to meet low demand periods. This makes the booster stations very inefficient compared to booster stations that are sized for varying demands.

Results

- Premium efficiency motors save on average 3-7% over standard efficiency motors
- The table lists equipment that will have premium efficiency motors and/or will be controlled by VFDs.

White Booster Station	**HP**	**Variable Frequency Drive**	**Premium Efficiency Motor**
White Booster Pump 1	3	Yes	Yes
White Booster Pump 2	5	Yes	Yes
White Booster Pump 3 (Future)	5	Yes	Yes
White Fire Pump 1	100	No	Yes
White Fire Pump 2	100	No	Yes
Taylor Booster Station	**HP**	**Variable Frequency Drive**	**Premium Efficiency Motor**
Taylor Booster Pump 1	5	Yes	Yes
Taylor Booster Pump 2	7.5	Yes	Yes
Taylor Booster Pump 3 (Future)	7.5	Yes	Yes
Taylor Fire Pump 1	100	No	Yes
Taylor Fire Pump 2	100	No	Yes
Vista Booster Station	**HP**	**Variable Frequency Drive**	**Premium Efficiency Motor**
Vista Booster Pump 1	5	Yes	Yes
Vista Booster Pump 2	10	Yes	Yes
Vista Fire Pump 1	100	No	Yes
Vista Fire Pump 2	100	No	Yes

[1] NOTE: Analysis is preliminary and will be completed when project has been awarded and pump & motor schedules are available

Energy Efficiency Improvements

- Equipment without premium energy-efficiency motors and VFDs result in a power usage of 181,000 kW-hr per year at an annual power cost of $17,500.
- Equipment powered by premium efficiency motors with VFDs result in a power usage of 125,000 kW-hr per year at an annual power cost of $12,200.
- The use of premium energy-efficiency motors and VFDs results in a power savings of 56,000 kW-hr per year and an annual cost savings of $5,300.

Conclusion

- By using VFDs and providing premium efficiency motors, the City will reduce their power needs by approximately 56,000 kW-hr per year and annual power costs by approximately $5,300 each year – a 30% overall savings in energy and costs.
- The equipment is GPR-eligible due to the 30% reduction in energy consumption and the payback on the investment (< 5 years) which is substantially less than the useful life of the equipment.
- **GPR Costs**:

Equipment Name	Cost
Variable Frequency Drivers	$55,000
Premium Efficiency Motors	$100,000
∴ FY15 Total =	**$155,000**

- **GPR Justification:** Business Case GPR-eligible (Energy Efficiency) per Section Section 3.2-3[2]: *"NEMA Premium energy efficiency motors";* and Section 3.5-1: *"Energy efficient…upgrades, or new pumping systems…including VFDs."*

[2] Attachment 2. April 21, 2010 EPA Guidance for Determining Project Eligibility. Page 19.

2. ADVANCED FLUORESCENT LIGHTING (PRELIMINARY)

Summary

- The design will incorporate high efficiency fluorescent lighting for interior lighting. T8 and/or T5 fixtures with high efficiency electronic ballasts will be used for most applications and T5HO fixtures for any high bay applications.
- Total Loan amount = $4,300,000
- Estimated Categorical energy efficient (green) portion of loan ≅ 0.7% ($31,500)
- Annual Energy savings = xx% (to be determined)

Energy Efficiency Improvements

- Energy efficient T-8 magnetic fluorescent lighting is approximately 28 percent more energy efficient than standard T-12 magnetic fluorescent lighting for relatively the same light output.[3]
- LED lighting is approximately 58 percent more energy efficient that typical high pressure sodium lighting for relatively the same light output.[4]
- The design will incorporate lighting control at each booster station, where applicable, in the form of dual technology occupancy sensors. Lighting control for building exterior and site lighting will be provided in the form of programmable lighting control panel(s) with timer and photocell inputs.

Conclusion

- **GPR Costs:**

Equipment Name	Cost
Fluorescent Lighting	$18,000
LED Lighting	$7,500
Lighting Controls	$6,000
∴ FY15 Total =	**$31,500**

- **GPR Justification:** Advanced fluorescent lighting is GPR-eligible by a Business Case per 3.5-6[5]: *Upgrade of POTW lighting to energy efficient sources such as …compact fluorescent*.

[3] National Lighting Product Information Program, *Lighting Answers*, Volume 1 Issue 1, April 1993.
[4] Global Green Energy, *ROI Analysis - 250W high pressure sodium vs. EcoBright 120W LED street light*, accessed via http://www.gg-energy.com/
[5] Attachment 2. April 21, 2010 EPA Guidance for Determining Project Eligibility. Page 20.

3. SCADA Control Technology (Preliminary)

Summary

- The SCADA system will be expanded to improve system controls to maximize efficiency.
- Estimated Loan amount = $4,300,000
- Estimated Business Case energy efficiency (green) portion of loan ≅ 2% ($45,000)
- Estimated annual energy savings $5,000 per year.

Background/ Results

- The SCADA system is part of the project both at the plant.
- BOOSTER PUMPS: The existing booster pumps have a recycle line that recirculates unused water during low demand periods (i.e. winter demands). Installing SCADA technology and associated instrumentation to the new booster stations eliminate the requirement for recirculation or throttling. Additionally, rather than being on/off controlled, the new pumps will be staged over the expected range of demands. The staged pumping will allow the multiple pumps to meet the wide range of demands by ramping up and down via a VFD. Using SCADA controls and technology, the staged booster pumps will save approximately 20% of the pumping efficiency due to operating at the optimal efficiency point of the booster pumps, and not recirculating water.
- OVERALL SYSTEM: Through a computer based Graphical User Interface (GUI) program the booster stations processes will be monitored and observed remotely. The SCADA GUI will save energy through reduced travel to and from the booster plants and by allowing demand and pump operating trends to be optimized.

Energy Efficiency Improvements

- BOOSTER PUMPS: For the booster pumps it is estimated 20% reduction of power use over a recirculation loop or low flow throttling. It is estimated that the domestic supply booster pumps would save approximately $4,000 per year.
- OVERALL SYSTEM: Remote SCADA control saves labor and travel costs = 1 person, 2 hour trip (All Boosters) per day at 10 miles per day is approximately $18,000 per year in labor costs; travel cost @ $0.51 per mile = $2,000 per year = total saving of $20,000/yr.

Conclusion

- Total SCADA savings approximately $24,000 /year in energy and labor costs (payback 2.7 years.)
- **GPR Costs**:

Equipment Name	Cost
SCADA Equipment	$65,000
∴ **FY15 Total =**	**$65,000**

- **GPR Justification**: SCADA system costs are GPR-eligible by a Business Case per Section 3.5-7[6]: *"Automated and remote control systems (SCADA) that achieve substantial energy savings."*

[6] Attachment 2. April 21, 2010 EPA Guidance for Determining Project Eligibility. Page 20.